UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/566,433	01/31/2006	Daisuke Mukai	5734-090631	5657

28289 7590 11/19/2010

THE WEBB LAW FIRM, P.C.
700 KOPPERS BUILDING
436 SEVENTH AVENUE
PITTSBURGH, PA 15219

EXAMINER	
ROE, JESSEE RANDALL	

ART UNIT	PAPER NUMBER
1733	

MAIL DATE	DELIVERY MODE
11/19/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/566,433
Filing Date: January 31, 2006
Appellant(s): MUKAI ET AL.

Kent E. Baldauf
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 2 November 2010 appealing from the Office action mailed 16 February 2010.

(1) Real Party in Interest

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

(1) Real Party in Interest

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The following is a list of claims that are rejected and pending in the application:

Claims 6-12 and 14-23 are pending.

Claims 6-10, 12, 14 and 16 are withdrawn from consideration.

Claims 11, 15, 17, 19 and 21-23 are rejected.

Claims 18 and 20 are objected to as being dependent upon a rejected base claim,

(4) Status of Amendments After Final

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

(5) Summary of Claimed Subject Matter

The examiner has no comment on the summary of claimed subject matter contained in the brief.

(6) Grounds of Rejection to be Reviewed on Appeal

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being maintained by the examiner except for the grounds of rejection (if any) listed under the subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

WITHDRAWN REJECTIONS

The following grounds of rejection are not presented for review on appeal because they have been withdrawn by the examiner.

For simplifying the appeal issue, the previous rejection of claims 11, 15 and 17-23 under 35 U.S.C. 103(a) as being unpatentable over Kaneko (US 6,261,517) alone, or alternatively in view of "Improvement of Characteristics of Hydrogen

Storage of Mischmetal-Nickel-Manganese Alloy” as submitted on the IDS of 07 July 2009 is withdrawn.

(7) Claims Appendix

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant’s brief.

(8) Evidence Relied Upon

US 6,372,059	Yasuda et al.	04-2002
US 5,910,379	Kasashima et al.	06-1999

Suzuki, et al., "Improvement of Characteristics of Hydrogen Storage of Mischmetal-Nickel-Manganese Alloy", Bulletin of The Government Research Institute, Osaka, 35[2], pp. 20-26, 1984.

Takeshita, T., "Low-temperature heat-capacity study of Haucke compounds CaNi5, YNi5, LaNi5, and ThNi5", Physical Review B, Volume 21, Number 12, 15 June 1980, pp. 5636-5641.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 11, 15, 17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yasuda et al. (US 6,372,059) alone, or alternatively in view of “Improvement of Characteristics of Hydrogen Storage of Mischmetal-Nickel-Manganese

Alloy" as submitted on the IDS of 7 July 2009.

In regards to claim 11, Yasuda et al. ('059) discloses a hydrogen storage alloy having a $CaCu_5$ structure represented by the formula $MmNi_aMn_bAl_cCo_d$ wherein Mm denotes a misch metal, $4.0 \leq a \leq 4.3$, $0.25 \leq b \leq 0.4$, $0.25 \leq c \leq 0.4$, $0.3 \leq d \leq 0.5$, and $5.05 \leq a+b+c+d \leq 5.25$. Although claim 11 recites the range $4.31 \leq a \leq 4.7$, a prima facie case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. MPEP 2144.05 I.

With respect to amended feature "$0.2 \leq c < 0.37$", Yasuda et al. ('059) discloses $0.25 \leq c \leq 0.4$ for the formula $MmNi_aMn_bAl_cCo_d$. Therefore, Yasuda et al. ('059) meets the claim.

With respect to the recitations "wherein in a composition of $5.25 \leq a+b+c+d \leq 5.30$, the a-axis length of the crystal lattice of said $CaCu_5$-type crystal structure is 500.5 pm and not more than 502.7 pm, and the c-axis length is not less than 405.6 pm and not more than 406.9 pm." of claim 11, Yasuda et al. ('059) discloses that the a-axis would be usually 500.3 to 501 pm and the c-axis would be between 404.9 and 405.8 pm (col. 3, lines 40-60). Alternatively, Yasuda et al. ('059) does not specify the claimed a-axis lengths and c-axis lengths.

In the Remarks filed 7 July 2009 (see page 12 of 15, paragraph 4), the Appellant admits that "Improvement of Characteristics of Hydrogen Storage of Mischmetal-Nickel-Manganese Alloy" teaches (last paragraph of page 93) that the axis length varies, and

thus can be modified, depending on heat treatment conditions.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the heat treatment conditions, as disclosed by “Improvement of Characteristics of Hydrogen Storage of Mischmetal-Nickel-Manganese Alloy”, in the heat treatment process, as disclosed by Yasuda et al. (‘059), in order to achieve the desired axis lengths, as disclosed by “Improvement of Characteristics of Hydrogen Storage of Mischmetal-Nickel-Manganese Alloy” (last paragraph of page 93). MPEP 2144.05 II.

With respect to the recitation "wherein the pulverization residual rate obtained by the following equation is 50% or more: Pulverization residual rate (%) = (post-cycling particle size/pre-cycling particle size) x 100, when a hydrogen storage alloy is ground and screened to select particles with a particle size in the range of 20 μm and 53 μm to provide hydrogen storage alloy powder, and after measuring with a particle size distribution measuring device the average particle size (pre-cycling particle size, D_{50}) of the hydrogen storage alloy powder, 2 g of the hydrogen storage alloy powder is weighed and placed into a PCT holder; the surfaces thereof are cleaned twice under hydrogen pressure of 1.75 MPa; then activation is carried out twice by introducing hydrogen of 3 MPa; next a cycle test using PCT device is repeated 50 times, wherein hydrogen gas of 3 MPa is introduced into 2.0 g of the hydrogen storage alloy powder to absorb hydrogen, and the hydrogen is desorbed at 45°C; and the average particle size of the hydrogen storage alloy powder after the test of the 50 cycles (post-cycling particle

size, D_{50}) is measured with a particle size distribution measuring device" of claim 11, the Examiner notes that because Yasuda et al. ('059) discloses substantially the same composition and substantially the same process (casting and vacuum heat treatment this property would be expected (Examples). MPEP 2112.01 I. Furthermore, the language "when a hydrogen storage alloy is ground…" is language that suggests or makes optional but does not require steps to be performed. MPEP 2111.04.

In regards to claims 15 and 19, Yasuda et al. ('059) discloses that the hydrogen storage alloy would be used as the anode material (negative electrode active material) for a battery (col. 4, lines 18-24).

In regards to claim 17, Yasuda et al. ('059) discloses $0.25 \leq b \leq 0.4$ for the formula $MmNi_aMn_bAl_cCo_d$, which overlaps the range of $0.4<b\leq 0.55$ as claimed.

Claims 11, 15, 17, 19 and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kasashima et al. (US 5,910,379) with evidence from Takeshita et al. (Low-temperature heat-capacity study of Haucke compounds $CaNi_5$, YNi_5, $LaNi_5$, and $ThNi_5$) alone, or alternatively in view of "Improvement of Characteristics of Hydrogen Storage of Mischmetal-Nickel-Manganese Alloy" as submitted on the IDS of 7 July 2009.

In regards to claims 11 and 21-23, Kasashima et al. ('379) discloses a $LaNi_5$ rare earth metal-nickel hydrogen storage alloy having a composition represented by the formula $RNi_aCo_bAl_cM_d$, wherein R stands for one or more of La, Ce, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu and Y (abstract and col. 3, lines 10-26); M stands for one or

more elements selected from the group consisting of Fe, Mn, Cr, and Cu (col. 3, lines 47-51); a, b, c, d, and e satisfy the relations of $3.0 \leq a \leq 4.5$, $0.30 \leq b \leq 1.0$, $0 \leq c \leq 0.6$, $0 < d \leq 0.5$, and $4.5 \leq a+b+c+d \leq 5.5$ (col. 3, lines 25-65). The composition of the rare earth metal-nickel hydrogen storage alloy of Kasashima et al. ('379) overlaps the low Co hydrogen storage alloy having a $CaCu_5$ crystal structure and composition represented by the general formula Mm $Ni_a Mn_b Al_c Co_d$, with the newly amended range of aluminum being $0.2 \leq c < 0.37$ wherein Mm is a Misch metal, $4.31 \leq a \leq 4.7$, $0.3 \leq b \leq 0.65$, $0 < d \leq 0.35$, and $5.25 \leq a+b+c+d \leq 5.30$. MPEP 2144.05 I.

Kasashima et al. ('379) discloses a rare earth metal-nickel hydrogen storage alloy having a composition as set forth above having a $LaNi_5$ structure, but Kasashima et al. ('379) does not specify that a $LaNi_5$ structure would be a $CaCu_5$ crystal structure.

Takeshita et al. teaches that a $LaNi_5$ structure would be a type of $CaCu_5$ crystal structure.

Therefore, the $LaNi_5$ structured rare earth metal-nickel hydrogen storage alloy, as disclosed by Kasashima et al. ('379), would be a type of $CaCu_5$ crystal structure, as evidenced by Takeshita et al.

With respect to the recitation "wherein in a composition of $5.25 \leq a+b+c+d \leq 5.30$, the a-axis length of the crystal lattice of said $CaCu_5$ crystal structure is 500.5 pm and not more than 502.7 pm, and the c-axis length is not less than 405.6 pm and not more than 406.9 pm." in claim 11; "wherein, in a composition of $5.30 \leq a+b+c+d < 5.35$, the axis length of the crystal lattice is not less than 500.0 pm and not more than 502.4

pm, and the c-axis length is not less than 405.9 pm and not more than 407.2 pm" in claim 21; "wherein, in a composition of $5.35 \leq a+b+c+d<5.40$, the a-axis length of the crystal lattice is not less than 499.8 pm and not more than 502.3 pm, and the c-axis length is not less than 406.0 pm and not more than 407.3 pm" in claim 22; and "wherein, in a composition of $5.40 \leq a+b+c+d<5.45$, the a-axis length of the crystal lattice is not less than 499.7 pm and not more than 502.3 pm, and the c-axis length is not less than 406.1 pm and not more than 407.4 pm" in claim 23, these lattice dimensions would be expected in the structure disclosed by Kasashima et al. ('379) because Kasashima et al. ('379) discloses the same or a substantially similar composition and structure in addition to substantially the same process (casting and vacuum heat treatment) (col. 5, lines 46-62). MPEP 2112.01 I. Alternatively, Kasashima et al. ('379) does not specify the claimed a-axis lengths and c-axis lengths.

In the Remarks filed 7 July 2009 (see page 12 of 15, paragraph 4), the Appellant admits that "Improvement of Characteristics of Hydrogen Storage of Mischmetal-Nickel-Manganese Alloy" teaches (last paragraph of page 93) that the axis length varies, and thus can be modified, depending on heat treatment conditions.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the heat treatment conditions, as disclosed by "Improvement of Characteristics of Hydrogen Storage of Mischmetal-Nickel-Manganese Alloy", in the heat treatment process, as disclosed by Kasashima et al. ('379), in order to achieve the desired axis lengths, as disclosed by "Improvement of Characteristics of Hydrogen Storage of Mischmetal-Nickel-Manganese Alloy" (last paragraph of page 93).

MPEP 2144.05 II.

With respect to the recitation "wherein the pulverization residual rate obtained by the following equation is 50% or more: Pulverization residual rate (%) = (post-cycling particle size/pre-cycling particle size) x 100, when a hydrogen storage alloy is ground and screened to select particles with a particle size in the range of 20 μm and 53 μm to provide hydrogen storage alloy powder, and after measuring with a particle size distribution measuring device the average particle size (pre-cycling particle size, D_{50}) of the hydrogen storage alloy powder, 2 g of the hydrogen storage alloy powder is weighed and placed into a PCT holder; the surfaces thereof are cleaned twice under hydrogen pressure of 1.75 MPa; then activation is carried out twice by introducing hydrogen of 3 MPa; next a cycle test using PCT device is repeated 50 times, wherein hydrogen gas of 3 MPa is introduced into 2.0 g of the hydrogen storage alloy powder to absorb hydrogen, and the hydrogen is desorbed at 45°C; and the average particle size of the hydrogen storage alloy powder after the test of the 50 cycles (post-cycling particle size, D_{50}) is measured with a particle size distribution measuring device" in claims 11 and 21-23, the Examiner notes that because Kasashima et al. ('379) discloses substantially the same composition and substantially the same process (casting and vacuum heat treatment) this property would be expected. MPEP 2112.01 I. Furthermore, Kasashima et al. ('379) teaches that the average grain diameter of the alloy powder would be in the range of 5 to 50 μm (col. 5, lines 63-67) in addition to pulverizing such that the average alloy particle diameter would be 35 μm (col. 6, lines

41-44) and the language "when a hydrogen storage alloy is ground..." is language that suggests or makes optional but does not require steps to be performed. MPEP 2111.04.

With respect to the recitation "wherein $0.4< b\leq 0.55$ in the general formula $MmNi_aMn_bAl_cCo_d$" in claim 17, in Kasashima et al. ('379), "d" corresponds with the manganese content and the range is $0<d\leq 0.5$ (col. 3, lines 25-65).

In regards to claims 15 and 19, Kasashima et al. ('379) discloses that the hydrogen storage alloy would be used as a negative electrode active material (abstract, col. 1, lines 7-11, and col. 6, lines 1-9).

(10) Response to Argument

Appellant's arguments filed 2 November 2010 have been fully considered but they are not persuasive.

First, the Appellant primarily argues that Yasuda et al. ('059), whether considered alone or in combination with the Suzuki article, does not teach or suggest a low Co hydrogen storage alloy, represented by the general formula $MmNi_aMn_bAl_cCo_d$, wherein $4.31 < a \leq 4.7$. The Appellant further argues that Yasuda et al. ('059) the range for *a* is $4.0 < a \leq 4.3$; the law requires that a reference be considered for all of its teachings, including a disclosure that diverges and teaches away from the invention at hand, as well as disclosures that point toward and teach the invention when interpreting the patentability of a claim; a *prima facie* case of obviousness cannot exist where a reference teaches away from the claimed invention; and Yasuda et al. ('059) clearly teaches away from Appellants' claimed invention by stating that "the ratio of Ni, *a*, is

from 4.0 to 4.3, desirably from 4.1 to 4.2 and if *a* is less than 4.0, the discharge characteristics are not satisfactory and if a exceeds 4.3, deterioration in insusceptibility to grain size reduction or life characteristics is observed”.

In response, the Examiner notes that although Yasuda et al. (‘059) does indicate that “the ratio of Ni, *a*, is from 4.0 to 4.3, desirably from 4.1 to 4.2 and if *a* is less than 4.0, the discharge characteristics are not satisfactory and if a exceeds 4.3, deterioration in insusceptibility to grain size reduction or life characteristics is observed”, when providing a numerical range in a scientific document, rounding of numbers to the nearest significant figure occurs and since Yasuda et al. ('059) does indicate that the ration of Ni, *a*, is from 4.00 to 4.30, for all practical purposes, the values for *a* in Yasuda et al. ('059) are actually on the order of from 3.96 to 4.34. Further support for this position can be found in no other than Tables 1-4 of Yasuda et al. (‘059). For instantce, in Table 1, Ex. 1-1, there is the a-lattice length of 500.5 pm and the c-lattice length of 405.6 pm, while the lattices in the claim 11 of the instant invention are a-axis length of 500.5 to 502.7 and a c-axis length of 405.6 pm to 406.9. If the teachings of Yasuda et al. (‘059) with respect to the alloy composition, and especially nickel, were not overlapping with the scope of the instant invention, then it would not be possible for these a- and c-lattice lengths to be achieved by Yasuda et al. (‘059). A *prima facie* case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). MPEP 2144.05 I.

Second, the Appellant primarily argues that the Examiner has mischaracterized independent claim 11 as a product-by-process claim and contends that claim 11 is unpatentable in view of Yasuda et al. (‘059) even though the hydrogen storage alloy of Yasuda et al. ('059) is made from a different process. The Appellant further argues that the pulverization residual rate of the low Co hydrogen storage alloy of independent claim 11 is a property of the low Co hydrogen storage alloy and not a method of manufacturing a low Co hydrogen storage alloy and the pulverization residual rate along with the steps for determining this rate must be considered by the Examiner because "[t]he structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art".

In response, the Examiner notes that the Examiner notes that because Yasuda et al. (‘059) discloses substantially the same composition and substantially the same process (casting and vacuum heat treatment this property would be expected (Examples). MPEP 2112.01 I. Furthermore, the language “Pulverization residual rate (%) = post-cycling particle size/pre-cycling particle size) x 100, ***when*** a hydrogen storage alloy is ground…" is language that suggests or makes optional but does not require steps to be performed and the Examiner has considered this as being optional processing steps. MPEP 2111.04. Additionally, since the grounding, screening and additional steps would be optional, the obtained pulverization residual rate property depends on upon the grounding an screening which is optional.

Third, the Appellant primarily argues that Kasashima et al. (‘379), whether considered alone or in combination with the Takeshita article and Suzuki article does

not teach or suggest, and, in fact, does not even mention that the low Co hydrogen storage alloy requires, in a composition of $5.25 \leq a+b+c+d < 5.30$, that the a-axis length, of the crystal lattice is not less than 500.5 pm and not more than 502.7 pm, and the c-axis length is not less than 405.6 pm and not more than 406.9 pm as required by independent claim 11; in a composition of $5.30 \leq a+b+c+d < 5.35$, that the a-axis length of the crystal lattice is not less than 500.0 pm and not more than 502.4 pm, and the c-axis length is not less than 405.9 pm and not more than 407.2 pm as required by independent claim 21; in a composition of $5.35 \leq a+b+c+d <5.40$, that the a-axis length of the crystal lattice is not less than 499.8 pm and not more than 502.3 pm, and the c-axis length is not less than 406.0 pm and not more than 407.3, as required by independent claim 22, or, or in a composition of $5.40 \leq a+b+c+d < 5.45$, that the a-axis length of the crystal lattice is not less than 499.7 and not more than 502.3 pm, and the c-axis length is not less than 406.1 and not more than 407.4 as required by independent claim 23.

In response, the Examiner notes that these lattice dimensions would be expected in the structure disclosed by Kasashima et al. (‘379) because Kasashima et al. (‘379) discloses the same or a substantially similar composition and structure in addition to substantially the same process (casting and vacuum heat treatment) (col. 5, lines 46-62). MPEP 2112.01 I. Alternatively, Kasashima et al. (‘379) does not specify the claimed a-axis lengths and c-axis lengths. In the Remarks filed 7 July 2009 (see page 12 of 15, paragraph 4), the Appellant admits that “Improvement of Characteristics of Hydrogen Storage of Mischmetal-Nickel-Manganese Alloy” teaches (last paragraph of page 93)

that the axis length varies, and thus can be modified, depending on the heat treatment conditions Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the heat treatment conditions, as disclosed by “Improvement of Characteristics of Hydrogen Storage of Mischmetal-Nickel-Manganese Alloy”, in the heat treatment process, as disclosed by Kasashima et al. (‘379), in order to achieve the desired axis lengths, as disclosed by “Improvement of Characteristics of Hydrogen Storage of Mischmetal-Nickel-Manganese Alloy” (last paragraph of page 93). MPEP 2144.05 II.

Fourth, the Appellant primarily argues that the heat treatment temperature disclosed in Kasashima et al. (‘379) is from 800°C to 1200°C and that of the Examples disclosed in Kasashima et al. (‘379) is 900°C, but in Kasashima et al. (‘379) it is disclosed that molybdenum is added in order to produce an intermetallic compound together with Co in the hydrogen absorbing alloy and resulting intermetallic compound exists as a secondary phase, and becomes the starting point of the crack of the hydrogen absorbing alloy caused by expansion and shrinkage when hydrogen is charged and discharged, and improves the initial low temperature property.

In response, the Examiner notes that the heat treatment in Kasashima et al. ('379) within a range of 800°C to 1200°C is further evidence that the same structure would form in Kasashima et al. (‘379) as in the instant invention since a substantially similar composition and heat treatment schedule are disclosed. Additionally, the instant claims do not preclude the presence of molybdenum and even with the presence of molybdenum, the alloy would have the same general formula and the Examiner has

treated this language in accordance with “comprising” language as set forth in MPEP 2111.03 since a general formula would not preclude the presence of minor alloy additions.

Fifth, the Appellant primarily argues that it is unlikely to perform heat treatment above 1000°C in Kasashima et al. (‘379) since the secondary phase disappears, which is the key point of the invention disclosed in Kasashima et al. ('379).

In response, the Examiner notes that Appellant argues that the secondary phase disappears upon heat treatment above 1000°C, the Examiner is not aware of a disclosure of disappearing secondary phase above 1000°C and since above 1000°C constitutes the same portion of the range as below 1000°C (range being 800°C to 1200°C) this would not constitute an unlikely scenario as argued by Appellant but rather an equally as likely scenario. Furthermore, if such is the case and the secondary phase were not desired by one having ordinary skill in the art, then one skilled in the art could just heat the alloy within the range of 1001°C to 1200°C as is disclosed in column 5 of Kasashima et al. (‘379) to achieve the absence of the secondary phase as argued by Appellant. MPEP 2144.04 (II).

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner’s answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Jessee Roe/

Examiner, Art Unit 1733

Conferees:

/ Roy King/

Supervisory Patent Examiner, Art Unit 1733

/Gregory L Mills/

Supervisory Patent Examiner, Art Unit 1700